# S·A·E JOURNAL

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C. W. Spicer, President — David Beecroft, Treasurer

John A. C. Warner, Secretary and General Manager

Norman G. Shidle, Executive Editor

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## About Authors

● **A. J. Blackwood** *(M '27) has presented several papers on automotive fuels and lubricants before the SAE. After graduating from Cornell as a mechanical engineer in 1924 he spent four years on the engineering faculty instructing in the experimental testing laboratories. He later joined the research staff of Mack Trucks and assisted in the development of their first six-cylinder truck and bus engines. After two years with Mack he went with what is now the Standard Oil Development Co. where he is in charge of the engine laboratories and automotive, Diesel and aviation fuel testing and development work.*

● **John M. Campbell** *(M '37)* and **Wheeler G. Lovell** *(M '37) have teamed together to present a number of papers before the Society. Quite often T. A. Boyd has collaborated with them. Both men are on the staff of the General Motors Research Laboratories Division. Mr. Campbell has concentrated his work on detonation, methods of eliminating it and ways of measuring its magnitude, and in this connection was active on the C.F.R. road tests at Uniontown, Pa., in 1932 and 1934. Mr. Lovell has done a great deal of research work on the utilization of gasolines in automobiles with the idea of securing a better fitting together of fuel and engine. He is assistant head of the organic chemistry department of the laboratories. Both men are graduates of M.I.T.*

● **R. M. Critchfield** *(M '20), chairman of the Indiana Section for 1937-1938, graduated from Ohio State as an electrical engineer in 1916, and has been working as one ever since. While at college he was a member of Eta Kappa Nu and Sigma Xi, honorary electrical and scientific fraternities. His first job, with Westinghouse Electric & Manufacturing Co., was terminated when he joined the United States Navy late in 1917, where he eventually assumed charge of the Fire Control Division. After the War he became assistant chief engineer of the Dyneto Electric Corp., retaining that position until he joined the engineering department of the Remy Electric Division*

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Your Society

# SAE Research

By Philip H. Smith

THIS is the *sixth* article of a series on "Your Society." This series aims to bring alive every phase of Society functioning as related to the individual member.

Philip H. Smith, contributing editor to *Scientific American*, was chosen by the Publication Committee to analyze the Society's functioning and to interpret it as it appeared to an informed outsider.

RESEARCH is a relative newcomer in the affairs of your Society, and for that matter, new in the life of the automotive industry.

If you peruse the early literature of the industry, you will find no reference to research. Instead, you will run across the oft-repeated contention that "our automobiles are now the peer of any European product." Year after year this was said, and in retrospect it reveals a sense of inferiority which was not overcome until research did become an essential part of automotive development.

And what does that prove? Simply that the inclusion of research among your Society's activities was a highly significant step. It charted a new road and, in certain instances, encouraged new industrial researches, notably those dealing with the relation of fuels to engines.

Research, as your organization understands it today, was undertaken in 1914. The formation of a Research Division of the Standards Committee in 1914 was a preliminary step in the direction of the new order, but by no means conclusive in shaping the character of present-day work. Research of the 1914 variety was more a matter of testing than of cooperative study on fundamental problems. When the Standards Committee had assembled its data and there were points to be settled, the Research Division was called in to arrange for determinations by testing.

But now to go back for a minute.

The acts of your Society spring from needs originating in the field. We have seen this to be true in the matter of standardization and it is no less true for research. An industry rushed to keep pace with demand for what it could produce had need for standardization before it felt any concern for tackling unknowns via research. Hence research as an offshoot of standards work. It was adequate up to and through the War years.

After the War, needs again interposed to demand consideration. Demand for gasoline put pressure on supply and quality suffered. If you were a petroleum engineer you found fault with existing automotive engines; if you were involved in engine design you discovered that the fuels available were atrocious. The clamor rose and your Society heard the call. In 1919 the Council established a Research Committee and charged it with evolving the ways and means for getting to work on the urgent fuel problem.

This act of the Council was highly important, though perhaps not fully appreciated at the time, because it meant the beginning of fruitful cooperative research. An automotive fuel committee was formed and a joint operation was soon under way bringing into action the National Automobile Chamber of Commerce and the American Petroleum Institute as the suppliers of funds, the Bureau of Standards as contributors and principal investigators, while to the Society was assigned the task of administering the funds and furnishing the secretariat. We can now say that the tone of the Society's research had begun to set. It was to bring organizations together, to coordinate work whenever possible and profitable, and to guide rather than to dominate the character of scientific endeavor.

If momentum was needed to keep the research ball rolling in the direction it had been going since 1919, the depression of 1920 and 1921 gave the final push. The automotive industry suffered quite a deflation. Editorials, which cried that all we needed was to work a little harder, filled the press. The industry had many misgivings, a little anguish, some soul-searching and the verbal manifestation of all this was heard by the Society. It rose to meet the need by organizing a Research Department to assist the Research Committee, but even more important it defined purpose in no uncertain terms and laid down operating specifications.

### Research Concepts Clarified

The research conception of 1921 was born of the depression, but, strangely enough, it was equally well suited to prosperity. That conception in every-day language was this: further pioneering is necessary in order to maintain progress; progress can come only through increased knowledge – ergo, more intensive, better directed research.

Of course, the Society was in no way fitted to engage in pure research, nor to take unto itself responsibility for solving all the problems of the industry. It had neither the funds nor the staff for any such ambitious undertaking, nor was the role thought to fit the Society. It must remember its place in the scheme of things and make up any deficiencies by the exercise of efficiency. And so was laid down a course which has served with minor alterations to this day.

In announcing the organization of the Research Department as much emphasis was laid upon the negative as the positive course it was to pursue. There was to be no special

research laboratory. There were ample facilities for research in existence and those were to be used whenever possible. Encroachment on the territory of secret commercial development was not to be brooked, rather, the keynote was to be cooperation with the industrial world. And, finally, usurpation of the function of the individual engineer was to be studiously avoided. On the positive side, cooperation was stressed. The function of the Society's research organization was to cooperate to save time and cost. Its duty would be to discover what was being done and had been done by others, and to correlate and interpret this scattered work to make it productive to members and the industry as a whole.

It can be seen that this program stemmed from uncertain times, when the uncertainty of the future called for getting closer to fundamentals. Yet, efficiency at any given moment is efficiency for the future and the 1921 declaration was attuned to every year that followed.

### CFR Bears Fruit

Cooperative Fuel Research, familiarly termed CFR, which launched the new research endeavor, was likewise the first to bear fruit, and there followed quickly a number of important results. The most economical distillation characteristics were determined, as a result of which, among other things, came easier starting under conditions of cold. Then came study of crankcase dilution and the phenomenon of "knock," the latter leading to development of measuring instruments. Likewise, vapor lock and gum problems came under close scrutiny.

Fuels and lubricants have played a dominant role in research activities, but not to the exclusion of other problems. Headlighting, highway safety, motor truck and bus impact, front wheel alignment and riding comfort have also figured as projects. There are several reasons why fuels and lubricants have predominated – they got off to a fast start; once cooperative endeavor was launched participating organizations were aggressive, and, being a fundamental problem involving many interests, the subject was well suited to get the kind of attention the Society was able to give.

All research organizations are faced with the problem of being productive. As one famous scientist admonished: "Watch closely or your research efforts will produce more foliage than fruit." And it is a fact that original aims may be forgotten if too much attention is paid to the seductive flora which line the path of investigation. Energies can be dissipated to the emotional satisfaction of the searchers, but to the dissatisfaction of those whose responsibility it is to justify the time and money expended. Every technical man has his predilections which may or may not fit into the general scheme of a desired goal, and to surmount this difficulty there needs to be a repeated defining of purpose.

Your Society undertook such a re-statement of purpose in 1935. In addition to stressing once again its cooperative aim and the desire to avoid duplication of effort, leaving to industrial, commercial or private handling those operations which they were best fitted to perform, the Society drew up regulations for procedure. Hitherto, the research organization had functioned without written rules, building up its own body of verbal understandings of what could and could not be done. Now they were to be recorded in black and white for all to see. Before any project could be undertaken it must first qualify as to having broad significance and wide application to the industry, while a written proposal must give a clear-cut statement of the problem, its terminal point and method of adequate financing.

The Research organization of the Society is headed by a General Research Committee. Its members are appointed by the Council and comprise qualified members of the Society and the chairmen of the Research Committees of which there are nine, exclusive of any special committees. In cases where the interests of a Professional Activity do not happen to be represented on the Committee, the Council may appoint a representative on the advice of the Research Committee chairman.

Under the Research Committee stands a Research Executive Committee, and as its title implies, it is empowered to act for the general committee in special instances. It keeps a close eye on all research activities so as to be able to report to the general committee on the progress made in projects, or on the advisability of any alterations in conduct of work. This Executive Committee has a membership made up of chairmen of the Research Committees.

The actual research work is carried on by Committees and their Divisions. The former is charged with the conduct of specific projects, while the latter handles detailed assignments designated by the Committees. Both the Committees and Divisions have membership appointed by the Council and chairmen designated by the President.

The foregoing committees represent the every-day working organization of the research set-up. On occasion there may be included Special Committees whose duty it is to serve in an advisory capacity to the Research Committee, the Research Executive Committee, or the Divisions. Sometimes these Special Committees will be empowered to work jointly or in cooperation with other organizations. Their members are appointed by the Council, while the chairmen are presidential appointees.

The Research organization never initiates projects. Its function is to listen to requests from the field, check the importance of suggestions as they apply to the industry at large, then, either set up the machinery for carrying on the project or show conclusively that it is not worthy of attention. The Executive Committee investigates proposals and reports to the General Committee on all details so that the latter can decide intelligently. Final authority for project approval rests with the Council as does the responsibility for the general scheme of operations.

### Limitations on Action

The duty to prevent unwise action – to counsel looking before leaping – is quite as important as giving the signal to go ahead. We might say, therefore, that the Committee has the duty of asking two questions which act to prune and promote sound growth, they are: "What are we trying to do?", followed by, "Is that what we want to do?"

Fruitfulness in the Society's research work depends upon many things. First, proposals must be weighed to eliminate all but the important. This requires that membership be composed of top-flight engineers who can recognize value when they see it. Next, cooperation must be had from the industry. If projects are well chosen there will be cooperation and there will be active participation by committee members – quite essential for productiveness. One good test of a project's worth is the willingness to back it financially. If the proponents are willing to finance, their energies will follow their money.

It is never known far in advance just what direction research is going to take. Research must always meet a need arising in the field, therefore, the future of your Society's work depends wholly on the course of the industry. Enough to know that when needs arise, they will be met. What insures success and helpfulness to the industry is the presence of a live organization, ready and competent to tackle any important problem that may arise.

Research is a continuing activity with a carry-over of experience and wisdom, looking to accomplish an accumulative good for all.

# National Aircraft Production Meeting

**Oct. 13, 14, 15**
**Los Angeles**
**Ambassador Hotel**

## Thursday, Oct. 13

### Materials — Afternoon

MAC SHORT, *Chairman*

Ten Years' Service Experience with Alclad Materials in Aircraft—FREDERICK C. PYNE, Aluminum Co. of America

Stainless Steel for Aircraft—V. W. WHITMER, Republic Steel Corp.

### Manufacturing Inspection — Evening

R. W. PALMER, *Chairman*

Measuring Surface Finish in Production—DR. ERNEST J. ABBOTT, Physicists Research Co.

Interpretation of Magnaflux Indications—BISHOP CLEMENTS, Wright Aeronautical Corp.

Magnaflux, What Does It Show?—J. B. JOHNSON, Wright Field

## Friday, Oct. 14

### Production Design — Morning

H. D. HOUGHTON, *Chairman*

Influence of Design on Costs—HARVEY CHRISTEN, Lockheed Aircraft Corp.

Coordinating Engine Design and Production—A. H. LEAK, Wright Aeronautical Corp.

### Safety Developments — Afternoon

J. L. ATWOOD, *Chairman*

Aircraft Accessories as Relating to Safety—R. P. LANSING, Eclipse Aviation Corp.

Investigation of Vapor Lock in Aviation Fuel Systems, C. F. R. Progress Report—DR. O. C. BRIDGEMAN, director, C. F. R. Vapor-Lock Project

### Airline Safety — Evening

HALL L. HIBBARD, *Chairman*

Airline Safety Engineering—J. A. HERLIHY, United Airlines Transport Corp.

Safety in the Air—A. E. RAYMOND—Douglas Aircraft Co., Inc.

## Saturday, Oct. 14

### Operation Inspection — Morning

E. H. HEINEMAN, *Chairman*

Insurance Inspection—JEROME LEDERER, Aero Insurance Underwriters

A Survey of Mechanical Failures of Aircraft During 1936 and 1937—GAYLORD W. NEWTON, Chief, Powerplant Branch, Aircraft Airworthiness Section, Civil Aeronautics Authority.

### Banquet and Grand Ball — Evening

Southern California Section—Hosts

W. E. POWELSON, *Chairman*

J. H. KINDELBERGER
*Master of Ceremonies*

Civil Aeronautics—The Act, the Authority and the Industry

HON. CLINTON M. HESTER

*Administrator, Civil Aeronautics Authority*

Followed by Dancing and Entertainment

***The Aircraft Production Meeting is sponsored by the Society of Automotive Engineers and its four Pacific Coast Sections with the cooperation of the Aeronautical Chamber of Commerce of America and the Air Transport Association of America.***

# News of the Society

## Cutting Overall Vehicle Operating Costs Theme of Three-Day Meeting

### SAE West Coast Sections Plan T & M Forum in Los Angeles from Nov. 3 to 5

FLEET operators, maintenance men and truck and bus manufacturers will attack the problem of lowering overall vehicle operating costs at the SAE West Coast Transportation and Maintenance Meeting at the Elks Club, Los Angeles, from Nov. 3-5.

Action is promised at each of the six sessions to be held on the first two days of the meeting. Plant visits are scheduled for the morning of the third day to be followed by a football game between the University of Southern California and the University of California – always a gridiron classic.

Private operators take the floor at the Thursday morning session with papers scheduled on keeping costs low in the transportation of petroleum products, and on the most economical plan for maintaining the private car.

In the afternoon operators of "for-hire" trucks will discuss plans for reducing costs of "for-hire" truck operations. General Chairman E. W. Templin and his committees have arranged for this discussion to be followed by a particularly interesting debate between two operators on, "Resolved: That it is Lower in Overall Cost to Own and Operate Trucks Than to Rent Them Operated."

A buffet supper in the evening will precede papers on the Army's plan for motor-vehicle maintenance in case of emergency.

Bus operators' problems will occupy Friday's opening session with papers planned on such subjects as fuel combustion in city bus operation and methods of keeping bus operating costs low. In the afternoon a representative of one of the leading parts manufacturers will tell what part companies such as his can play in reducing vehicle operating costs. Other papers at this session will delve into the problems of overhead and depreciation.

The T & M Banquet is planned for that evening with after-dinner addresses on regulation of highway carriers, "for-hire" and private, and on California's contributions to low-cost motor-vehicle operation.

Students will take the spotlight at luncheons planned for the first two days of the meeting. SAE student members from Oregon State College and the University of California will tell what their respective colleges are doing that is important to Pacific Coast motor-vehicle operators.

Saturday's plant visits will include the option of inspecting the Ethyl Gasoline Corp. Tune-Up Clinic, the National Automotive & Diesel Schools and Los Angeles Railway Bus Maintenance Shops.

The football game is not an official part of the program, but it is expected that a large number of those attending the meeting will take it in.

### Truck Men Meet on Boat

**The Executive Committee of the Motor Truck Rating Committee last month held an all-day meeting on Chairman F. K. Glynn's motor cruiser, the "Sally Duck," on Long Island Sound. Shown above are committee members F. B. Lautzenhiser, Mr. Glynn, B. B. Bachman and L. R. Buckendale. Present also was Donald Blanchard, secretary of the committee.**

### Field Editors

*Baltimore* – N. L. Dods
*Buffalo* – C. W. Georgi
*Canadian* – Warren B. Hastings
*Chicago* – Austin W. Stromberg
*Cleveland* – W. A. Maynard
*Dayton* – R. H. Henry
*Detroit* – William F. Sherman
*Indiana* – Harlow Hyde
*Kansas City* – No Appointment
*Metropolitan* – Grosvenor Hotchkiss
*Milwaukee* – L. M. Kanters
*New England* – J. T. Sullivan
*No. California* – R. W. Goodale
*Northwest* – R. J. Hutchinson
*Oregon* – Sid Hammond
*Philadelphia* – H. E. Blank, Jr.
*Pittsburgh* – Murray Fahnestock
*St. Louis* – C. T. Schaefer
*So. California.* – W. A. F. Millinger
*So. New England* – Edwin S. Sessions
*Syracuse* – C. T. Doman
*Washington* – P. R. Wheeler

## Suggest Extension of Trailer Coupling R.P.

Since last January, when the Society adopted the first recommended practice for passenger-car trailer couplings, there has been discussion as to the merit of extending this specification to include a smaller size to be used on luggage trailers, etc., and a larger size for heavy-duty service. Extension of this specification to include military automotive towing equipment is also being considered.

The present recommended practice is printed on pages 90 and 91 of the 1938 SAE HANDBOOK and includes specifications for two sizes of trailer couplings: No. 1 for gross trailer weights up to and including 5000 lb., and the No. 2 coupling for gross trailer weights of over 5000 lb.

It has been suggested that the coupling for luggage trailers should have about half the strength of the No. 1 coupling, and that for heavy-duty service about double the strength of the No. 2 coupling.

The SAE Standards department is circularizing members of its Trailer Subdivision and firms in the trailer industry to determine their reaction to the suggestion.

## Mahoney Presented "Tin" Golf Trophy

**● Milwaukee**

Racine Country Club was the scene of the Milwaukee Section's Sept. 16 meeting, and golf the order of the day.

Thirty-two golfers teed off in the afternoon and later arrivals brought the total attendance to 53 at the dinner which followed. Section-Chairman John J. Hilt presented the golf awards, including the traditional "tin" loving cup for the highest gross score, which was won (?) for the second time in three years by J. A. Mahoney.

(*News of Society continued on page 12*)

# SAE Nominees for 1939

*FOLLOWING are the names of those who have been nominated as officers and members of the Council for 1939:*

President . . W. J. Davidson

*General Sales Manager, Diesel Engine Div., General Motors Sales Corp.*

Treasurer . . . David Beecroft

*Bendix Products Div., Bendix Aviation Corp.*

## Councilors

Term of 1939-1940

W. E. McGraw

*Chief Engineer, Chrysler Corp. of Canada, Ltd.*

G. L. Neely

*Research Engineer in charge of Fuels and Lubricants, Standard Oil Co. of Calif.*

A. L. Beall

*Research Engineer, Wright Aeronautical Corp.*

***Members of the 1939 Council will include also the following three men who were elected at the beginning of 1938 for a two year term:***

L. J. Grunder

*Automotive Engineer, Richfield Oil Corp.*

B. J. Lemon

*New Products Dept., U. S. Rubber Products, Inc.*

W. J. Davidson

*General Sales Manager, Diesel Engine Div., General Motors Sales Corp.*

***Serving on the 1939 Council as Past-Presidents:***

Harry T. Woolson

*Executive Engineer, Chrysler Corp.*

C. W. Spicer

*Vice-President, Spicer Mfg. Corp.*

## Vice-Presidents

Aircraft . . . . . William Littlewood

*Vice-President, Engineering, American Airlines, Inc.*

Aircraft-Engine . . . . . H. K. Cummings

*Chief, Automotive Power Plants Section, National Bureau of Standards*

Diesel-Engine . . . . . F. G. Shoemaker

*Chief Engineer, Detroit Diesel Engine Div., General Motors Corp.*

Fuels & Lubricants . . . . . A. G. Marshall

*Manager, Technical Applications, Shell Oil Co.*

Passenger-Car . . . . . John G. Wood

*Assistant Chief Engineer, Chevrolet Motor Div., General Motors Corp.*

Passenger-Car-Body . . . . . I. L. Carron

*Body Engineer, Dodge Bros. Div. of Chrysler Corp.*

Production . . . . . W. B. Hurley

*Staff Engineer, Sales Dept., Detroit Edison Co.*

Tractor & Industrial Power Equipment . . . . . J. S. Erskine

*Engineer, Allied Industrial Equipment, International Harvester Co.*

Transportation & Maintenance . . . . . Harry O. Mathews

*Automotive Engineer, Public Utility Engineering & Service Corp.*

Truck, Bus & Railcar . . . . . Carl J. Bock

*Truck Division Engineer, General Motors Truck & Coach Div., Yellow Truck & Coach Mfg. Co.*

## State Stations Inspect Washington's Vehicles

● **Northwest**

Motor-vehicle inspection work is still in the experimental stage and can be improved, C. E. Fritts, traffic engineer for the Washington State Department of Highways, told 50 members and guests attending the first 1938-1939 meeting of the Northwest Section at Seattle, Sept. 9. With him on the program was D. B. Rigg of the Washington State Commission on Equipment, who told how lighting and safety devices for motor-vehicles are tested. Equipment which has not been approved by the Commission, he stated, may not be legally sold in the state. Both speakers were introduced by Section Chairman Harley W. Drake.

Mr. Fritts, who directs the operation of Washington's comparatively new program of motor-vehicle inspection, reported that twelve inspection stations are now in operation and that several more will be built next year. Analysis of reports of drivers involved in accidents in the State during the first five months of 1938, he said, indicate that 13.6 per cent of the accidents involved vehicles that had faulty equipment. Although he believes that this figure may not be accurate because of the difficulty involved in getting dependable information, Mr. Fritts is certain that defective equipment is a contributing cause to many accidents. He also believes that periodic visits to testing stations tend to make the average driver more safety conscious.

The authority to institute this inspection program was granted by the 1937 State Legislature in that section of the Highway Code pertaining to vehicle loading and inspection, Mr. Fritts reported. He noted that the main purposes of the code are to reduce accidents and to stimulate the movement of traffic.

Any accident-reduction program, the speaker contends, must take into account the vehicle, the driver and the highway. It is Mr. Fritts' belief that the first and second factors may be controlled by legislation, but that the planning and construction of safe highways depends upon those in charge of highway construction and maintenance work.

Mr. Fritts called attention to the fact that there has been a 70 per cent increase in traffic in the United States during the past ten years and stated that highway administrators have been placed in the unfortunate position of attempting to fit this increased traffic to existing highways.

New road construction, he said, is being designed for the future with an eye to such safety features as: sufficient sight distance, ample roadway width to handle traffic flow, division of four-lane highways by unpaved strips, center stripping and reflectorized signing.

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*Friday noon luncheons are being held by the Northwest Section at the Benjamin Franklin Hotel. SAE members and their guests are cordially invited to attend these informal meetings.*

## Research Committees Report on Projects

Research Committee activities have been progressing steadily throughout the summer and members are preparing for a heavy fall and winter program.

Highways Research Committee members have been asked to answer some twenty questions and considerations prepared by the chairman in connection with a study of the practicability of standardizing the method and apparatus used for measuring friction between the tire and the road. The members are also studying a description on the tire and road-test equipment used at Ohio State University.

The Ignition Research Committee is considering transmission of the cable, ignition, high-tension, motor-vehicle type, material specification to the General Standards Committee, and reports that the cable, ignition, high-tension, aeronautic-type, material specification is nearing completion.

The Cooperative Fuel Research Committee is progressing on many projects. The Aviation Fuels Division's laboratory detonation projects are advancing and some progress has been made on the laboratory phase of the vapor-lock investigation which will be reported at the National Aircraft Production Meeting in Los Angeles this month, subject to release by the C.F.R.

Twenty-one laboratories have joined the C.F.R. Automotive Diesel Fuels Exchange Group, and the first set of samples is in their hands for testing for ignition quality.

Returns of the 1938 Summer Gasoline Survey are being analyzed.

Test work on the Cooperative Road Test Program for 1938 is in progress in the four geographical sections: eastern, mid-continent, north central and Pacific Coast.

## Revival of Tricycle Landing Gear Lauded

● **No. California**

Revival of the tricycle-landing gear was declared one of the most interesting recent engineering trends in aviation by F. W. Herman, assistant chief engineer of the Douglas Aircraft Co., Inc., in speaking at the Northern California Section meeting Sept. 13. George M. Smith, operations engineer, Pacific Division, Pan American Airways, the second speaker, explained the seven methods of navigation used by the Clipper Ships in over-ocean flying.

The full-feathering propeller which keeps a dead engine in a multi-motored ship from "wind milling" is another recent improvement mentioned by Mr. Herman. He stated that without this type of propeller the power absorbed by the propeller of a dead engine equals that required for a climb of about 30 ft. per min. in a ship the size of the DC-3.

He also mentioned the utilization of a separate powerplant for operating auxiliary equipment as an important development. On the DC-4, he said, the plant is a 6½-kw., 115-volt, 800-cycle gasoline driven electric generator.

In listing advantages of the tricycle-landing gear, Mr. Herman stated that its most important qualities are those which give the airplane inherent directional stability on the ground and that make it practically impossible to ground loop. This type of landing gear greatly reduces the hazards of landing in restricted areas and cross-wind. With it, he added, it is possible to make a normal approach to the field, that is to glide down, level off, and hold the plane at an attitude near the stall. He noted, however, that contrary to normal practice the elevator controls are thrust forward, thus reducing the angle of attack and eliminating the tendency of the plane to bounce off again. Once on the ground, he explained, there is no restriction to use of the brakes.

In describing the two years of concentrated research work behind the development of the tricycle-landing gear used on the DC-4, Mr. Herman explained that the first phase of the program was conducted with a test chassis built of welded steel tubing and equipped with two main wheels independently braked, a nose wheel and a tail wheel. He noted that provisions were made for loading the chassis with pig lead and for shifting the center of gravity while in motion so as to change from conventional to tricycle-landing gear. After being towed by a truck up to a speed of 50 m.p.h., he said, the towing cable was cast off and the chassis, while coasting free, put through every maneuver imaginable. Moving pictures were taken of the nose wheel at all times while the chassis was moving over bumpy surfaces and ruts, with the nose wheel in various fore and aft positions, he added.



## At World's Fair Grounds

**William S. Knudsen, president of General Motors Corp., drives the first rivets into the steel framework of the General Motors exhibit which will be one of the main points of interest to SAE World Automotive Engineering Congress delegates when they visit the New York World's Fair during the New York sessions of the Congress, May 22-26, 1939.**

**More than 30 of the world's leading automotive engineering societies have been invited to participate in the Congress which continues in Indianapolis, Detroit and San Francisco after five days of technical sessions in New York. In San Francisco delegates will have time to visit the Golden Gate Exposition, which will include many automotive exhibits, as well as to attend technical sessions which will be held from June 6-8.**

The second phase, Mr. Herman reported, was conducted on a bi-motored amphibian which was equipped with a nose wheel. He explained that the amphibian was put through the same tests as the towed chassis, tires were intentionally blown out and take-offs and landings were made in circular paths, up-wind, down-wind and cross-wind, so as to cover all possible hazards met in service.

After completing these tests with the steel-tubing chassis and the amphibian, he said, sufficient data were available to insure the success of the tricycle-type landing gear which has been adopted for the DC-4.

"Navigating the Clipper Ships" was the title of Mr. Smith's informal talk. Over-ocean flying, he said, is considerably different than flying over land as "hedge hopping" to find your way is of little use because all oceans look the same. He then described the seven methods used by Pan American Airways to insure the accuracy of navigation, which are: 1. Piloting – manual and automatic; 2. Dead reckoning – based on speed, direction and time, the background of all navigation; 3. Celestial – extensively used and primarily accomplished with sextant, chronometer and tables, using the sun, moon or stars for sights; 4. Radio – also extensively used which includes the taking of bearings on shore stations as well as ships at sea; 5. Meteorological observations – not exactly a means of navigation, but necessary in navigation; 6. Engineering and cruise control – consists of checking actual operating conditions against predicted results which are made prior to the start of the trip; 7. Flight control at stations – consists of an accurate check of the flight as received by radio from the Clipper and the radio contact between the ship and the shore.

All of these methods are constantly used as a check on each other, he said, insuring the maximum of safety.

Mr. Smith also explained how the ship is thoroughly tested by the crew the day prior to departure, how meteorological forecasts and the choice of one of eight routes to Honolulu are made, how gasoline is loaded to control the center of gravity and how estimates are made for the rate of fuel consumption for various periods of the trip.

## Revisions; New Projects On Standards Program

The SAE Standards Committee and its many Divisions this fall are revising established standards to meet current conditions as well as developing new standards.

Under consideration for revision are SAE Standards for certain non-ferrous metals including: aluminums, copper alloys and die castings. Modernization of heat-treating specifications for SAE steels is under way. Aircraft and aircraft-engine manufacturers have been asked to review all SAE aircraft standards and to recommend what revisions should be made and to suggest new standards necessary. Work is already progressing on revisions in a number of aircraft-engine standards.

Bearing manufacturers have drafted new tables of ball-bearing standards under procedure of the American Standards Association. The SAE Standards Committee is reviewing them. If approved the new tables will supersede present SAE and American Standards and will be in agreement for interchangeability with tables prepared by Committee 4 of the International Standards Association.

Specifications relating to various types of motor-vehicle lighting equipment have been approved by the Lighting Division with the cooperation of the Illuminating Engineering Society and are now before the General Standards Committee for approval. They will be issued for general use as soon as possible.

The development of a standard for ignition condensers is being considered. Questionnaires have been sent to interested companies regarding the feasibility and desirability of such a standard.

The Automobile Manufacturers Association has collected considerable information on bumpers, especially with regard to bumper interlocking, which is up for review by the General Standards Committee.

A recent proposal to develop testing standards for rubber and rubber products has been referred to the SAE representative on Committee D-11 of the American Society for Testing Materials which is working on this problem.

This is but a partial list of SAE Standards activities. The Committee is constantly studying the desirability of new standards, revision of those already established and the cancelation of standards which are no longer of use.

## *"Damper" Wins Battle of Words*

Should the word "damper" or "dampner" be used with reference to the inertia device on a crankshaft to absorb or check vibration? Asked that question by a member of the Society, R. S. Burnett, SAE Standards Manager, questionnaired a few others on the subject, adding the word "dampener" for good measure.

"Damper" received all but two of the 28 votes cast; the dissenters favoring "dampner."

The SAE JOURNAL is inserting "damper" in its style sheet, and the word is being considered as a worthy addition to the often referred to SAE Automobile Nomenclature, which may be found on pages 701 to 731 of the 1938 SAE HANDBOOK.

## Student Branch Reports Election of Officers

● **Purdue**

With the opening of the fall Semester SAE Student Branch activities at Purdue University are getting under way. New officers of the Branch are: C. E. Dixon, president; H. R. Mitchell, vice-president of meetings; J. V. Tippy, vice-president of membership; T. W. Conron, Jr., vice-president of publications, and S. G. Luther, Jr., secretary-treasurer. Prof. H. M. Jacklin of the School of Mechanical Engineering is faculty adviser for the Branch.

## Yacht-Club Outing Opens Fall Program

● **Metropolitan**

For Metropolitan Section, the fall season was opened with facts, fun and frolic at Manhasset Bay Yacht Club, Port Washington, L. I., Sept. 15.

The afternoon was spent in yachting with Commodores Kliesrath, Sommers and Glynn. Trips were made to the German mother ship, *Friesenland* to view the *Nordstern,* latest and largest of the transatlantic catapult planes. Swimming also was enjoyed until mess call signaled dinner. There was an interlude of popular songs by Ellen Holden, one of the guests, and dancing for the rest of the evening. About 100 members and guests attended.

*Every Thursday Metropolitan Section members meet for a 12:30 luncheon at the City Club, 55 West 44th St., New York. Out of town members and their guests are invited to join Met Section men at these informal gatherings when in the city.*

## Student Branch Honors Its Graduating Members

● **G.M.I.**

In honor of its graduating members, the SAE Student Branch at General Motors Institute held a banquet meeting at the Bishop Airport, Aug. 16. Some 40 members and guests attended.

Capt. J. E. Briggs, United States Army Air Corps, Selfridge Field, was introduced as speaker of the evening by Chairman Louis White. His talk was followed by the showing of "Coast to Coast," a moving picture supplied by United Air Lines.

Among the guests at the banquet were Clyde E. Cole, manager of Bishop Airport, who made the airport's facilities available to the Branch, and N. McNeil, station manager, Pennsylvania Central Airlines.

# About SAE Members:

## Aircraft Men

**STANLEY S. LA SHA** to Bell Aircraft Corp., Buffalo, as aeronautical engineer, from Porterfield Aircraft & Engineering Corp., Kansas City. . . . **CHESTER J. DUNN** joined Vega Airplane Co., Burbank, Calif., as draftsman. . . . **SIDNEY CORNELL** to Lockheed Aircraft Corp., Burbank, as senior detailer. . . . **A. S. MENASCO** has resigned as vice-president and director of Menasco Manufacturing Co. and will take a six-month vacation to recuperate from a recent illness. . . . **C. F. LIENESCH,** president of Air Agency, Los Angeles, and treasurer of the SAE Southern California Section, has been elected president of Non-Scheduled Aviation, Inc. Mr. Lienesch also is president of the Southern California Chapter of the National Aeronautic Association. . . . **JOHN J. IDE,** field representative of the National Advisory Committee for Aeronautics, stationed in Paris, will supply the Civil Aeronautics Authority with information on civil flying developments in Europe.

**VINCENT BENDIX,** SAE past-president, recently was guest of the Bergen County (New Jersey) Chamber of Commerce at an exhibition of flying arranged in his honor. Participating in the exhibition was **EMIL KROPF** (FM '37), Deutsch-Amerikanische Petroleum Gesellschaft, Germany, who demonstrated an Argus-powered Feiseler-Storch airplane which displayed a speed range of from 20 to 100 m.p.h. Following the demonstration Mr. Bendix was guest of honor at a dinner given by the Chamber.

## Overseas

**W. O. KENNINGTON** has resigned his position as managing director, Delco-Remy & Hyatt, Ltd., London, in order to give more time to his activities at Vauxhall Motors, Ltd., of which he has been a director for many years. He will continue his affiliation with Delco as chairman of the board. . . . **L. J. OSTERMAN** has been named sales manager, Aktiebolaget Hans Osterman, Stockholm, Sweden. . . . **PETER I. CARP** has resigned his position as works manager and chief engineer, Industria Aeronautica Romana S.A. Brasov, Roumania. . . . **PETER L. HILL,** Royal Indian Army Service Corps, heavy repair shops, Deolali, India, is en route to England for a four-month leave. He recently was transferred from Quetta to Deolali.

## Bits of News

**T. A. BOYD,** head, fuel department, Research Laboratories Division, GMC, is chairman of the Detroit District Committee of the American Society for Testing Materials. . . . **DR. ZAY JEFFRIES,** technical director, incandescent lamp department, General Electric Co., chairmans the Cleveland Committee on Arrangements for the joint meeting of the American Iron & Steel Institute and the Institute of Metals of Great Britain, which runs from Oct. 3 to 25, and includes plant visits in several cities.

## SAE Travelers

**MAURICE OLLEY** and **MAURICE PLATT,** Vauxhall Motors, Ltd., England, visited the United States last month, spending several weeks at General Motors plants in Detroit. . . . They arrived on the Queen Mary which was making her 99th trip. . . . **H. M. CRANE,** technical assistant to the president, General Motors Corp. was also on board. . . . **C. F. KETTERING,** general director of GMC Research Laboratories Division, sailed for Europe early last month. . . . Late in August **ALFRED P. SLOAN, JR.,** GMC chairman, and **EDSEL B. FORD,** president Ford Motor Co., returned from Europe. . . . **DR. GUSTAV EGLOFF,** Universal Oil Products Co., recently home from abroad, discussed "The Motor Fuel Economy of Europe" at the Sept. 5-9 meeting of the American Chemical Society in Milwaukee. . . . Other SAE speakers were **W. B. ROSS,** Pure Oil Co., and **F. L. GARTON** and **T. B. RENDEL,** Shell Petroleum Corp. . . . **FREDERICK HANDLEY PAGE,** managing director, Handley Page, Ltd., visited the United States as a member of the British Air Ministry.

**Maurice Olley**
*Visits United States*

**Maurice Platt**
*Accompanies Olley*

**GEORGE W. WOLF** has been placed in charge of operations (supply, manufacturing, assembly and engineering) of General Motors Overseas Operations. He previously was assistant general manager of the GM Export Co. Last March Mr. Wolf represented the SAE at the 1938 Automotive Engineering Convention sponsored by the Institution of Automotive Engineers, Australia, at Sydney.

## Notes of Interest

**REID RAILTON** (FM '35) is designer of the racing car in which John R. Cobb averaged 350.2 m.p.h. at Bonneville Salt Flats last month, establishing a short-lived world's land speed record. **REAR-ADMIRAL EMORY S. LAND,** chairman of the United States Maritime Commission, officiated at the 12th International Lifeboat Race in New York early last month. . . . The crew of the yacht **Rene,** belonging to **ALFRED P. SLOAN, JR.,** is reported to have rescued three 16-year-old boys from drowning in Long Island Sound late in August.

## SAE Speakers

**F. L. HAUSHALTER,** development engineer, B. F. Goodrich Co., and **B. P. GRAVES,** director of design, Brown & Sharpe Manufacturing Co., on the Oct. 5-7 program of the American Society of Mechanical Engineers, Providence, R. I. . . . **MILLER McCLINTOCK,** director, Yale Bureau for Street Traffic Research, addressed the 16th Annual Convention of the American Institute of Steel Construction at French Lick, Ind., Oct. 11-14. . . . The American Welding Society's program for its 19th Annual Meeting, Oct. 16-21, Detroit, includes **COL. G. F. JENKS,** Ordnance Department, United States Army, **C. L. EKSERGIAN,** chief engineer, Budd Wheel Co., and **H. C. DRAKE,** director of research, Sperry Products, Inc. . . . **J. F. WINCHESTER,** Standard Oil Co. of N. J., led a round-table discussion of proposed Federal and state legislation of private motor carriers at the National Petroleum Association's Annual Meeting, Atlantic City, Sept. 14-16. . . . **B. D. KUNKLE,** director, General Motors Manufacturing Staff, delivered the commencement address at the graduation exercises of General Motors Institute, Aug. 23.

## SAE Appointments

**A. G. HERRESHOFF,** chief engineer, research, Chrysler Corp., and chairman of the SAE Engineering Relations Committee, as the Society's representative at the Sixth Annual Conference of Motor Vehicle Administrators, Detroit, Oct. 4-8. . . . **L. E. LIGHTON,** design division, Electric Storage Battery Co. and chairman of the Electric Equipment Division of the SAE Standards Committee, to serve on the Amer-

**A. G. Herreshoff**
*Appointed*

ıcan Standards Association Sectional Committee C-40 on Storage Batteries. . . . **AUSTIN M. WOLF,** consultant, and **F. K. GLYNN,** American Telephone & Telegraph Co., as representative and alternate respectively on the ASA Highway Traffic Standards Committee. . . . **E. W. UPHAM,** metallurgist, Chrysler Corp., will serve for the SAE on the American Society for Testing Materials Committee B-5 on Copper and Copper Alloys. . . . **A. LUDLOW CLAYDEN,** as SAE representative on the American Gear Manufacturers Association Committee on Gear Lubricant Classifications. . . . **LIEUT. JOHN W. C. BRAND** is named to the SAE Aircraft-Engine Lubricants Research Committee and the SAE Fuels Research Committee.

## Promotions

**DR. D. P. BARNARD** advanced to associate director of research in charge of engine laboratories by Standard Oil

**Dr. D. P. Barnard**
*Advanced*

Co. of Ind. He was assistant director of research at the Whiting, Ind., laboratory. . . . **E. S. MACPHERSON,** promoted from engineer in charge of design to chief of design by Chevrolet. . . . **JOHN S. NAERY,** formerly assistant to the president, Donaldson Co., Inc., selected to manage the company's new district office in Milwaukee.

## SAE 1938 Graduates

**B. H. SHEPARD,** Yale '38, is in the testing department, Terry Steam Turbine Co., Hartford, Conn. . . . From the University of Michigan **MAX WENDER** went to the Navy Yard, Brooklyn, as junior engineer; **CARL H. SCHRAMM,** to Lockheed Aircraft Corp., Burbank, Calif., as engineer, and **CHU-TA CHOW** to the Vultee Aircraft Manufacturing Corp. at Downey, Calif. . . . also at Lockheed is **JACK C. METZGER** from Ohio State University, a detail draftsman. . . . **JOSEPH B. SEPIC,** Carnegie Institute '38, is doing shop work for the Hydril Co. of Pa., Rochester, Pa. . . . **FRANK C. KREITLER, JR.,** Newark College of Engineering graduate, is with Federal Shipbuilding and Dry Dock Co., Kearny, N. J. . . . From Louisiana State University, **HARRY S. SAUCIER, JR.,** is teaching chemistry at the Crowley (La.) High School. . . . **THOMAS J. HERRICK** is continuing at Purdue as instructor in applied mechanics.

## New Connections

**HARRY I. HAZZARD** resigned as chief engineer of the American Bantam Car Co. to accept a position as engineer in the engine division of Briggs & Strat-

## SAE Men Active in Soap Box Classic

**Northern California Section members were active on the technical committee which conducted the 3rd Annual Soap Box Derby in San Francisco. Those in white are: R. W. Martland, J. R. MacGregor, E. J. McLaughlin, R. W. Goodale (*SAE Journal Field Editor*), W. V. Hanley and H. R. Porter. In the background, wearing a dark hat, is Section Secretary W. S. Crowell.**

ton Corp., Milwaukee. . . . **JOHN A. ENGLISH** joined the Merrill Spring Co., New York. . . . **WILLIAM M. SIESEL** left Wright Aeronautical to become research engineer with Elastic Stop Nut Corp., Elizabeth, N. J. . . . **HOWARD A. REINHART** is sales engineer with Olympic Refining Co., Long Beach,

**H. A. Reinhart**
*New Connection*

Calif.; he was president of Reinhart Motors, Inc., San Francisco. . . . **FREDERIC R. SPEED** joined Briggs Clarifier Co., Washington, D. C., as engineering manager of equipment sales.

## Win $2187.73

Five SAE members submitted prize-winning papers on welding in a contest sponsored by the James F. Lincoln Arc Welding Foundation, netting them a total of $2187.73 of the $200,000 awarded. . . . **RALPH H. UPSON,** consulting engineer for the Kay Products Co., Detroit, received $1322.82, the third prize for papers entered in the aircraft classification. . . . **HARRY WUNSCH,** mechanical engineer, Silent Hoist Winch & Crane Co., Brooklyn, and **R. S. ROSE,** chief engineer, Wentworth & Irwin, Inc., Portland, Ore., won third and fourth prizes of $305.26 and $203.51, respectively, in the bodies division of the automotive classification. . . . In the trailer division, **RAY F. KUNS,** president Trotwood Trailers, Inc., was awarded fourth prize of $203.51, and in the frames division, **CARL WILLIAM FLOSS,** Detroit, won fifth prize, amounting to $152.63. . . . The J. F. Lincoln Arc Welding Foundation was created by the Lincoln Electric Co. in honor of its president, J. F. Lincoln.

## Honored

**DR. ING. FERDINAND PORSCHE,** designer of Germany's new "People's Auto" was honored by his government Sept. 6, when he was awarded the third German "national culture prize" for his work. Although this car, which is reported to cost about half as much as the lowest-priced German car at present, is not yet in mass production it has been readily subscribed for in advance by Germans of modest means.

**W. E. LERCH,** formerly chief engineer of Hemphill Diesel Schools, Inc., is now located at 440 Washington St., New York, as engineering representative for several European concerns.

**ROBERT W. SLOANE,** formerly engineer with Monarch Governor Co., is with the Zenith Carburetor Division of Bendix Aviation Corp., Detroit.

## Obituary

### Fay Leone Faurote

Fay Leone Faurote, public relations counselor, died at his Garden City, Long Island, home, Sept. 5, after a long illness. He was fifty-seven years old.

Mr. Faurote, a member of the SAE since 1911, participated in many of the Society's activities. The Engineering Exhibit, held each year in conjunction with the SAE Annual Meeting, was managed by him for several years. He was chairman of the Institutional History and Mu-

seum Committee from 1931 to 1936, and from 1935 to 1937 served on the Society's Grading Committee. He was the Society's publicity manager from 1930 to 1932.

After receiving his degree of B.S. in M.E. from the University of Michigan in 1903, Mr. Faurote joined the Olds Motor Works as assistant experimental engineer. Later he turned to advertising and was that company's advertising manager until 1907. Subsequently he held advertising and public relations posts with the E. R. Thomas Motor Co., The Curtiss Aeroplane & Motor Corp. and several advertising companies. He also taught for several years and was author of a biography of Glenn H. Curtiss and a series of interviews with Henry Ford and other books.

In 1921 he established his own business in New York, specializing in automotive advertising and public relations.

## Perry L. Tenney

Perry L. Tenney, who is widely known for his work in connection with the development of the automatic transmission while transmission engineer at Olds and Buick, succumbed to a heart attack on Aug. 22 at his home in East Lansing, Mich. He had been associated with the General Motors Corp. in various engineering capacities for more than 20 years. Since May he had been in the Diesel Engine Division, as sales engineer.

Mr. Tenney became a member of the SAE in 1917 and at the time of his death represented the Society on the American Standards Association Sectional Committee B-5, Standardization of Small Tools and Machine Tool Elements, Technical Committee 13 on Splines. As chairman of a special group of the Sectional Committee assigned to develop the standard for involute splines, he was almost entirely responsible for the actual development of this standard. Mr. Tenney also represented the Society on ASA Sectional Committee B-6, on Standardization of Gears. Earlier he was a member of the SAE Passenger Car Activity Committee and of the Standards Committee.

Born in Alameda, Calif., in 1884, Mr. Tenney's first contact with the automotive industry came as manager of the Oakland, Calif., United Auto Rental Co. in 1907. After that he managed a fleet, operated his own company, did research and efficiency work for Packard, was efficiency engineer for Warner Manufacturing Co. and Mason Motor Co., and was manufacturing engineer of T. W. Warner Co., before taking the position of chief engineer, Muncie Products Co., a division of G.M.C.

## Arnold N. Taylor

Arnold N. Taylor, chief engineer of the C. M. Hall Lamp Co., Detroit, died of a heart attack while at work on Aug. 18. Born at Winchelsea, Ont., 45 years ago, he attended the University of Toronto and was graduated in 1915.

Mr. Taylor had been employed by the Hall company and the Edmund & Jones Corp., which it succeeded, since 1921. He did considerable experimental development work in connection with automotive lighting equipment and had been a member of the lighting division of the SAE Standards Committee since 1933. He was made a member of the Society in 1931.

# SAE *Coming* EVENTS

**Baltimore – Oct. 6**

Engineers Club; dinner 6:30 P.M. Subject – Diesel Engines.

**Buffalo – Oct. 11**

Statler Hotel; dinner 6:30 P.M. Bearings – G. W. Christ.

**Canadian – Oct. 19**

Royal York Hotel, Toronto; dinner 7:00 P.M.

**Chicago – Oct. 4-5**

Blackstone Hotel. Participation in National Truck, Bus and Railcar Meeting of the Society.

**Cleveland – Oct. 10**

Cleveland Club; dinner 6:30 P.M. Fuels and Lubricants – Julian J. Frey, engineer, Ethyl Gasoline Corp.

**Detroit – Oct. 3, 17 and 25**

Statler Hotel. Oct. 3 – dinner 7:00 P.M. The Economic Outlook – J. H. Van Deventer, editor, *The Iron Age*.

Oct. 17 – 8:00 P.M. Joint meeting of Aeronautic and Junior Student Activity.

Oct. 25 – 8:00 P.M. Symposium on Insulation and Air Conditioning of Automobiles.

**Indiana – Oct. 13**

Antlers Hotel; dinner 6:30 P.M. The "Tocco" Process of Hardening – W. E. Benninghoff, manager "Tocco" Division, The Ohio Crankshaft Co.

**Kansas City – Oct. 4**

Hotel Kansas Citian; dinner 6:30 P.M. Automotive Two-Cycle Diesel Engine – Stanley B. Tuttle, project engineer, Detroit Diesel Engine Division, General Motors Corp.

**Metropolitan – Oct. 13**

Hotel New Yorker, New York City; dinner 6:30 P.M. Streamlined Super-Trains – Otto Jabelmann, assistant to the president, in charge of research, Union Pacific Railroad, and E. E. Chapman, Santa Fe Railroad. Light Streamlined Trains – W. H. Mussey, The Pullman Co. A representative from the E. G. Budd Mfg. Co., will join in the discussion of these papers. Two films will be shown; one "Diesels Working on the Railroad" by the General Motors Corp., and another "Construction of Light-Weight Passenger Cars" by the Pullman Co.

**Milwaukee – Oct. 4**

Milwaukee Athletic Club; dinner 6:30 P.M. Looking Ahead in Engineering – William B. Stout, president, Stout Engineering Laboratories, Inc. Inspection of new "Club Car."

**New England – Oct. 11**

Engineers Club, Boston; dinner 6:30 P.M.

**Northern California – Oct. 5**

Bellevue Hotel, San Francisco; dinner 6:30 P.M. New Firing Lines for Engineers – C. W. Spicer, vice-president, Spicer Mfg. Corp., and president, SAE. Truth Through Torture – John A. C. Warner, secretary and general manager, SAE.

**Northwest – No meeting.**

**Oregon – No meeting.**

**Philadelphia – Oct. 12**

Engineers Club; dinner 6:30 P.M. Truck Chassis Maintenance – B. B. Bachman, vice-president, chief engineer, Autocar Co.

**Pittsburgh – Oct. 18**

Webster Hall; dinner 6:30 P.M. Spark Plugs and Ignition – Hector Rabezzana, chief engineer, Spark Plug Div., AC Spark Plug Div., General Motors Corp.

**Southern California – Oct. 13-15**

Ambassador Hotel, Los Angeles. Participation in National Aircraft Production Meeting of the Society.

**Southern New England – Oct. 5**

Bond Hotel, Hartford, Conn.; dinner 6:30 P.M. Aerial Conflict in China – L. R. Dooley, Far-Eastern representative, Chance Vought Aircraft Div., United Aircraft Corp.

**Syracuse – No meeting.**

**Washington – Oct. 11**

Cosmos Club; dinner 6:30 P.M. Foreign Military Motor Vehicles – A. W. S. Herrington, president, Marmon-Herrington Co., Inc.

### Truck, Bus and Railcar Meeting

**Oct. 4-5** — **Chicago**
**Blackstone Hotel**

### Fuels & Lubricants Meeting

**Oct. 6-7** — **Tulsa, Okla.**
**Hotel Mayo**

### National Aircraft Production Meeting

**Oct. 13-15** — **Los Angeles**
**Ambassador Hotel**

### West Coast Transportation and Maintenance Meeting

**Nov. 3-5** — **Los Angeles**

### Annual Dinner

**Nov. 14** — **New York City**
**Commodore Hotel**

### National Transportation Engineering Meeting

**Nov. 14-16** — **New York City**
**Hotel New Yorker**

### Annual Meeting

**Jan. 9-13, 1939** — **Detroit, Mich.**
**Book-Cadillac Hotel**

# New Members Qualified

**These applicants who have qualified for admission to the Society have been welcomed into membership between Aug. 15, 1938, and Sept. 15, 1938.**

**The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.**

### Baltimore Section

GRATZ, FRED M. (A) Glenn L. Martin Co., Middle River, Baltimore.

### Canadian Section

BAILEY, WM. G. D. (A) garage superintendent, Loblaw Groceterias Co., Ltd., Fleet & Bathurst Sts., Toronto, Ont.

DOBSON, FRANKLIN ALVER (M) project engineer, Canadian Car & Foundry Co., Aviation Div., Fort William, Ont. (mail) 223 S. Archibald St.

### Chicago Section

NEWBY, CLARENCE L. (M) manager, western div., Hyatt Roller Bearing Sales Co., Chicago (mail) 332 S. Michigan Ave.

### Cleveland Section

EVANS, R. D. (M) manager, passenger & truck tire design, tire testing, Goodyear Tire & Rubber Co., Akron, Ohio.

WECKSTEIN, SAMSON M. (M) chief engineer, industrial div., Timken Roller Bearing Co., Canton, Ohio.

### Dayton Section

ZERBO, JOHN D. (A) cost accountant, traffic and service manager, Strietmann Biscuit Co., Cincinnati, Ohio.

### Detroit Section

HUTCHINSON, JOHN M. S. (J) student, Dodge Bros. Corp., Detroit. (mail) 35 Mapleton Road, Grosse Pointe, Mich.

IRELAND, W. C. (A) 157 Merriweather Road, Grosse Pointe Farms, Mich.

MACDONALD, CHARLES E. (J) junior engineer, Chrysler Corp., Highland Park, Mich. (mail) 111 Highland Ave., Apt. 114.

TASKER, EDWIN MURRAY (A) vice-president, charge of sales, Toledo Stamping & Machine Co., 99 Fearing Blvd., Toledo, Ohio.

### Metropolitan Section

BRAUNSDORFF, R. K. (A) lamp engineer, Tung Sol Lamp Works, Inc., 95 Eighth Ave., Newark, N. J. (mail) 370 Orange St.

### Milwaukee Section

CHAPMAN, HENRY C. (A) sales engineer, Stolper Steel Products Corp., 3258 W. Fond du Lac Ave., Milwaukee (mail) 7636 Stickney Ave.

### Philadelphia Section

HUFNAGEL, F. B., JR. (A) manager, motor transportation, Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.

VAN HARTESVELDT, C. H. (J) assistant supervisor, automotive laboratory, research & development dept., Atlantic Refining Co., 260 S. Broad St., Philadelphia, Pa. (mail) 106 Richfield Road, Upper Darby, Pa.

### St. Louis Section

PARRISH, GEORGE IMBODEN (A) secretary, treasurer, Bondall Co., 500 Bittner St., St. Louis, Mo.

### Southern California Section

RACHAL, CLIFTON (J) draftsman, handbook writer, Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica (mail) 1416 S. Glendale Ave., Glendale, Calif.

WITHROW, ARTHUR C. (A) owner, Arthur C. Withrow Co., 1425 S. Flower St., Los Angeles.

### Washington Section

HARMAN, J. W. (A) president, Harman-Loving, Inc., Belvidere & Broad Sts., Richmond, Va.

### Outside of Section Territory

APPELT, HENRY C. (J) assistant engineer, Muskegon Piston Ring Co., Muskegon, Mich.

MCKAY, H. J. (A) vice-president, National Battery Co., 1728 Roblyn Ave., St. Paul, Minn.

### Foreign

BOLD, EDWARD (A) works manager, Walter Sylvester, Ltd., Tunstall, Stoke-on-Trent (mail) "Hillview" Leek Road, Stockton-Brook, Stoke-on-Trent, England.

HARFORD, ARTHUR JAMES (A) automotive engineer, Alba Petroleum Co. of Australia, Pty., Ltd., 340 Flinders St., Melbourne, C. 1, Australia.

MORIMOTO, TATSUMA (F M) chief engineer, Light Motors Co., Ltd., 3-2 Chome, Shibaura, Shibaku, Tokyo, Japan.

OSBORNE, LEONARD FRANK (J) service engineer, aeronautical engines, Armstrong Siddeley Motors, Ltd., Parkside, Coventry, England. (mail) 52 Gregory Ave.

PATEL, NUSLI SORABJI (A) assistant to works manager, Bombay Garage, P. O. Box 566, Bombay 6, India. (mail) Rupa-Villa, Crumballa-Hill.

STREET, LEONARD T. (J) sales engineer, technical representative, Automotive Products Co., Ltd., Brock House, Langham St., London W. 1, England. (mail) 62 Halley Road, Forest Gate, London, E. 7, England.

TEVES, HEINZ (A) vice-president, Alfred Teves Maschinen Fabrik, Frankfurt am Main, Germany.

# Applications Received

**The applications for membership received between Aug. 15, 1938, and Sept. 15, 1938, are listed herewith. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.**

### Canadian Section

CARR, MURRAY O., manager, Murray Carr & Co., Toronto, Ont.

### Chicago Section

BJELLAND, CARL W., tune-up mechanic, Sinclair Refining Co., Chicago.

COOK, DEWEY D., president, Cooktite Ring Sales Co., Chicago.

### Cleveland Section

CASS, ROBERT, engineer, White Motor Co., Cleveland.

PITTENGER, JOHN M., editor, Brake Service, Babcox Publications, Inc., Akron, Ohio.

WOLCOTT, L. C., chief engineer, Packard Electric Division, General Motors Corp., Warren, Ohio.

### Dayton Section

HUNTINGTON, FREDERICK W., LIEUT.-COL., executive officer, charge of organized reserve affairs, United States Army, Infantry, Dayton, Ohio.

### Detroit Section

FAGER, OSCAR HENRY, special lubrication representative, Shell Petroleum Corp., Detroit.

GOAD, LOUIS CLIFFORD, general manager, AC Spark Plug Division, General Motors Corp., Flint, Mich.

HICKS, RICHARD V., test engineer, Chevrolet Engineering Laboratory, Detroit.

LONEY, HARLEY C., president, Harley C. Loney Co., Detroit.

MCINTYRE, CHARLES S., secretary and service manager, Monroe Auto Equipment Co., Monroe, Mich.

NEWBERG, WILLIAM CHARLES, experimental engineer, Chrysler Corp., Highland Park, Mich.

SULLIVAN, J. D., district manager, Gates Rubber Co., Detroit.

WIDMAN, CHARLES HENRY, vice-president, director of sales, The Murray Corp. of America, Detroit.

WOOD, HARRY H., sales representative, Gulf Refining Co., Toledo, Ohio.

### Kansas City Section

RUMMEL, ROBERT W., chief engineer, Rearwin Airplanes, Kansas City, Kan.

### Metropolitan Section

BEYERSTEDT, FRED, motor fuels research, Standard Oil Development Co., Elizabeth, N. J.

GITLIN, JACK, service manager, Atlantic Transportation Co., Inc., New York.

MARTIN, THOMAS A., treasurer and engineer, Marnall Steel Co., Inc., New York.

SWEENEY, WILLIAM J., associate director of Esso Laboratories, Standard Oil Development Co., Elizabeth, N. J.

### Milwaukee Section

BAYERLEIN, ROLAND W., sales manager, Nordberg Manufacturing Co., Milwaukee.

DAVIS, C. LYLE, district manager, Macmillan Petroleum Corp., Milwaukee.

### New England Section

MILLER, ERNEST C., special representative, Pennsylvania Grade Crude Oil Association, Cambridge, Mass.

STANLEY, HAROLD D., vice-president, superintendent, Perrine Quality Products Corp., Waltham, Mass.

### Northern California Section

SHAWK, HARRY ABEL, chief lubrication engineer, Tide Water-Associated Oil Co., Associated Division, San Francisco.

### Northwest Section

BEEZER, EDWARD P., claims adjuster, Kenworth Motor Truck Corp., Seattle, Wash.

SHELL OIL CO., Seattle, Wash.

### Philadelphia Section

ERRIG, WILLIAM F., president, Peco Manufacturing Corp., Philadelphia, Pa.

ROSS, WALTER HERBERT, assistant chief inspector, Hall Aluminum Aircraft Corp., Bristol, Pa.

*(Concluded on page 22)*

# SAE Papers in Digest

**HERE are digests of papers presented at various meetings of the Society.**

**Some of these papers will be printed in full in the SAE JOURNAL.**

**Mimeographed copies of *all papers received* will be available, until current supplies are exhausted, at a cost of 25 cents per copy to members; and at 50 cents per copy to non-members, plus 2% sales tax on those delivered in New York City. Orders for mimeographed copies must be accompanied by remittance and should be addressed to Sessions Secretary, Society of Automotive Engineers, 29 West 39th St., New York.**

## 1938 Annual Meeting
## Detroit, Mich., Jan. 10-14

**Maintenance of a Concentrated Fleet of Large Trucks – *G. W. Laurie, Atlantic Refining Co.* (Paper published in full, pages 123-130, Transactions Section, March 1938 issue.)**

**Economic Maintenance of a Concentrated Fleet of Mixed Vehicles – *S. B. Shaw, Pacific Gas & Electric Co.***

THE author has outlined his ideas as to the principal factors involved in the economical maintenance of a fleet of mixed vehicles, based on experience with a group of fleets aggregating over 2,200 vehicles, all operated in Northern California.

The general factors affecting maintenance are referred to, such as selection of vehicles, their assignment, systematic lubrication, and standardization, as well as the control of speeds and loads.

Particular emphasis is placed on the advantages to be gained by preventive maintenance and inspections. The principal items to be inspected are given, together with some of the inspection methods used and the defects disclosed by them.

Mention also is made of the new developments directed toward wear reduction that are being experimented with.

**Maintenance of a Scattered Fleet – *H. O. Mathews, Public Utility Engineering & Service Corp.* (Paper published in full, pages 281-284, Transactions Section, July 1938 issue.)**

**Practical Aerodynamics – *Dr. Alexander Klemin and E. B. Schaefer, New York University.***

THIS paper, as its title implies, deals with the results of practical experimentation in airplane design undertaken mainly in cooperation with organizations of standing in the aviation industry. Ad-hoc research of this character is sometimes quite as helpful to the industry as more systematic and scientific research, and is not reported as frequently as is really desirable.

The paper, first of all, takes up the problem of the more powerful and larger gun now being put into service on military airplanes. Wind-tunnel tests of such a gun appropriately mounted indicate that the aerodynamic forces and moments developed on the exposed gun are so large that, in spite of special windshields and balancing vanes, the gunner would have a difficult task in handling the piece with any degree of efficiency.

The second part of the paper takes up the rather interesting results that can be obtained with a present-day biplane type incorporating the stagger-decalage principle with its attendant advantages in regard to static longitudinal stability.

The third part of the paper is devoted to a pertinent problem of the day – the effect of interference of the component parts of the airplane on the static longitudinal stability. This interference is illustrated by a discussion of the results obtained on model tests of three designs in which the static-longitudinal-stability characteristics were not wholly desirable. An account of the manner in which these difficulties were circumvented in the laboratory may help other designers confronted with similar problems.

The next part of the paper deals with the exposition of results obtained on a test of a two-control airplane which incorporates a novel trailing-edge flap.

Then, finally, the results obtained on a test of air resistance of a streamlined loop antenna are presented, with a discussion of interference effects.

**Airplane Performance Calculations by Means of Logarithmic Graphs – *Ivan H. Driggs, Glenn L. Martin Co.* (Paper published in full, pages 253-262, Transactions Section, June 1938 issue.)**

**What Fleet Operators Should Know About Tires – *J. E. Hale, Firestone Tire & Rubber Co.* (Paper published in full, pages 101-117, Transactions Section, March 1938 issue.)**

**Air-Track System of Aircraft Instrument Landings – *G. L. Davies, Washington Institute of Technology.***

AN adequate instrument-landing system is one of the elements necessary to permit safe flights through adverse weather conditions.

The first work on this problem was performed by the Bureau of Standards, the research culminating in a demonstration of the complete system at Newark, N. J., in 1933, hundreds of hooded landings and one blind flight having been made. Later in 1933 some members of the Bureau staff engaged in this work joined the Washington Institute of Technology to continue development work and adapt the system for commercial operation.

The result of this work is the Air-Track, a system embodying all the basic principles proved by the Bureau of Standards and meeting all the specifications set up by the airlines. The ground equipment comprises ultra-high-frequency visual localizer, glide path, and marker beacon transmitters, all crystal-controlled, together with a monitor and remote-control system assuring proper indications in the airplane. The localizer and glide-path transmitters are mounted in a trailer so that they may be located in the best position for the wind conditions existing at the time of use, and will not constitute a hazard when not in use.

Immediate installation of instrument-landing equipment is desirable, not only from the standpoint of safety, but to begin the accumulation of operating experience which alone will permit lowering of present minimums and increased regularity of service.

Relief of present congestion at busy airports in bad weather is another important function of instrument-landing equipment, and it may be expected reasonably that the traffic-handling capabilities of airports will be increased from 25 to 50 per cent in bad weather by the addition of landing systems. Further progress in instrument-landing technique is up to the airlines themselves, as actual operating experience is now lacking.

**Automatically Controlled Blind Landings – *Capt. G. V. Holloman, U. S. Army Air Corps.* (Paper published in full, pages 13-18, SAE JOURNAL, June 1938 issue.)**

**The Outlook Toward Legal Performance Requirements – *Prof. J. T. Thompson, Johns Hopkins University.* (Paper published in full, pages 209-214, Transactions Section, May 1938 issue.)**

**The Accessory-Drive Problem of Aircraft Engines – *R. P. Lansing, Eclipse Aviation Corp.* (Paper published in full, pages 205-208, Transactions Section, May 1938 issue.)**

**Analysis of Improvements in Aviation Spark-Plugs – *T. Tognola and A. W. DeChard, Scintilla Magneto Co., Inc.***

IN presenting this paper we have confined our efforts solely to the discussion of the Bendix design of aircraft spark-plugs, the considerations which resulted in the adoption of certain features or novelties which we term improvements, and the results of our laboratory tests which qualified our design considerations. Comparisons with other spark-plug designs have been avoided purposely.

We describe the considerations which prompted us to adopt the so-called "mushroom" design of ground-and-core electrode, the erosion tests on various materials suitable for electrodes and the equipment used for these tests, the voltage required for various electrode designs under our test procedure, and the actual voltage required to fire various designs of Bendix spark-plugs under single-cylinder test conditions.

We also discuss the comparison of peak breakdown voltages in relation to pressure-bomb testing in $CO_2$, a preliminary investigation of the value of cooling fins applied to an orthodox type of spark-plug, together with an explanation of the equipment used in correlating these data.

**Engine Installation and Related Problems in Large Aircraft – *Ivar L. Shogran, Douglas Aircraft Co.* (Paper published in full, pages 225-228, Transactions Section, May 1938 issue.)**

**Accessory Knock Suppressors – *L. B. Kimball, Fuel Development Corp.***

A NUMBER of accessory knock suppressors have been created since the detonation phenomenon first became a factor in automotive design.

Devices embodying various principles, such as the injection of water or exhaust gas into the carburetor, an automatic spark regulation, and carburetor-enriching devices, have made their appearance in one form or another. The last two mentioned are in common use today.

A system of detonation control has been developed over a period of years for the automotive and aircraft fields, comprising an accessory unit which meters required amounts of a knock suppressor into the engine at the proper time. Several units have been in use on privately owned cars for several years and during the past two years they have been in regular use on many transport planes.

For aircraft use, the suppressor fluid was designed to have de-icing properties and is a very efficient carburetor and propeller de-icer. This characteristic has brought the system into the category of safety devices, in that aircraft carburetors cannot ice up on the take-off. Throttles can be left at the take-off positions for a longer period of time in cases of emergency. The emergency controls can be used in obstinate cases of carburetor ice formation.

**The Motor Vehicle Administrator Looks at the Automobile – *C. A. Harnett, Commissioner of Motor Vehicles, State of New York.***

THIS paper presents a composite view of what state motor-vehicle administrators think of the modern motor car and how it can be improved from the safety standpoint. In the main it is a report of a questionnaire survey made among the members of the American Association of Motor Car Administrators to which 42 administrators sent in their viewpoints.

The three points stressed by the administrators were headlights, speed, and visibility. A majority of the administrators consider the present headlamps unsatisfactory, and 27 express the view that modern cars have too much speed. Recommendations for the consideration of automobile manufacturers on other aspects of automobile design also are set forth.

**Air Conditioning of Automobiles and Buses – *L. W. Child, Evans Products Co.* (Paper published in full, pages 263-268, Transactions Section, June 1938 issue.)**

**New Technique for Noise Reduction – *Ernest J. Abbott, Physicists Research Co.* (Paper published in full, pages 170-184, Transactions Section, April 1938 issue.)**

**An Appraisal of Current Progress in Automotive Manufacturing – *Joseph Geschelin, Automotive Industries.***

THIS paper presents a quick high-spotting of progress in automotive manufacturing methods principally by noting various phases of current development. In describing the set-up of new manufacturing plants, the author points out that worker-comfort and seeing are the vital elements in the design of buildings and production lines.

The gamut of manufacturing plants is visualized as falling within the following categories: mass production, job-mass production, and job-lot production.

In seeking a keynote for modern production activity and planning, two features seem to predominate: flexibility of operation for all manner of establishments; and universality of production equipment and facilities for job-lot work.

Coordination of engineering and production departments is found to be the key to economy in progressive organizations. Examples are given of some specific plants in which this type of coordination has been developed highly. Tribute is paid to the machine-tool manufacturers whose mechanical genius and advanced research in machine-shop practice have contributed so much to the advancement of automotive production.

A section of the paper is devoted to brief details of important processes that have been adopted during the past few years. In fact, these examples may be taken as a gage of progress during the past ten years.

**The Use of Self-Tapping Screws in Mechanical and Structural Assemblies – *Ralph Upson, consulting engineer.***

SINCE their introduction about 20 years ago, self-tapping screws have increased steadily in use and, for the past year, they are reported to have led all fasteners in transportation equipment with respect to the percentage of increased use. Yet their availability for substantial construction is only beginning to be realized, and joints in which they are employed have hitherto been without established engineering basis.

The object of this paper to remedy this situation by putting into usable form the considerable mass of experimental data now available from Governmental and private agencies, guided by fundamental principles and well-proved practice in the use of fasteners generally. Among the items of interest are optimum joint proportions for different materials and loadings, effects of vibration, and the possibility of still further improvement in the self-tapping screw design.

It is concluded that this type of screw will continue to earn increasing importance in joints and connections for which welding is undesirable.

**The Diesel as a High-Output Engine for Aircraft – *E. G. Whitney and H. H. Foster, National Advisory Committee for Aeronautics.* (Paper published in full, pages 161-169, Transactions Section, April 1938 issue.)**

**Diesel Engine Deposits as Influenced by Fuel Types and Operating Conditions – *J. R. MacGregor and W. V. Hanley, Standard Oil Co. of Calif.* (Paper published in full, pages 272-280, Transactions Section, July 1938 issue.)**

**The Reduction of Piston-Ring and Cylinder Wear – *Macy O. Teetor, The Perfect Circle Co.* (Paper published in full, pages 137-140, Transactions Section, April 1938 issue.)**

**What Is an E.P. Product? – *J. A. Moller, Pure Oil Co.***

IN this paper the author looks at the extreme-pressure lubricant situation from the point of view of the lubricant itself, as well as the point of view of laboratory testing. Both types of investigation are related to results obtained in the field. Test results on six typical extreme-pressure lubricants are compared and discussed.

The paper concludes that laboratory tests may be correlated with field data and may be reproduced among laboratories within a small degree of error. The author closes with a plea for joint cooperation between suppliers and users so that the problems will be solved before, rather than after, they become urgent commercially.

**Effect of Oil Characteristics on Wear in Aviation Engines – *Dr. O. C. Bridgeman and M. L. Leidig, National Bureau of Standards.***

AN analysis is reported of the general problem of wear on materials used in aviation-engine cylinders and piston-rings with particular reference to the effect of oil characteristics on wear. One method is described that is being used at the National Bureau of Standards for the investigation of oil characteristics on wear in aviation engines in which particular attention is given to the effect of compounding agents in decreasing wear. The growing number of variables that complicate aircraft lubrication are reviewed.

The author concludes that wear is not an inherent property, and that no wear value can be assigned to any metal which will have significance except in relation to the specific test conditions under which the wear value was obtained. He suggests that, in addition to compounding for wear control, it may be necessary or desirable to compound for reduction in ring-sticking, for high oiliness, for extreme-pressure characteristics, and for protection against corrosion and rusting so that aircraft lubricants will be compounded to suit the characteristics desired.

**Diesel Supercharging – Its Effect on Design and Performance – *Russell Pyles, Clark Brothers Co.* (Paper published in full, pages 215-224, Transactions Section, May 1938 issue.)**

**General Consideration of the Supercharging of Diesel Engines – *Harte Cooke, American Locomotive Co.***

IN general, the reason for supercharging is to increase the output of Diesel engines.

By increasing the amount of air taken in by the engine, a corresponding increase in the amount of fuel burned can be obtained without an appreciable increase in the maximum temperature of the combustion. This arrangement enables a considerable increase in output of the larger size Diesel engines and, as the increased density in the cylinder materially improves the combustion, it also enables a considerably increased output to be obtained from the smaller sizes of Diesel engines.

There are a number of arrangements for providing the air necessary for the supercharging. The one used depends in each case on the particular conditions of each installation.

The principal thing that has delayed the use of supercharging of Diesel engines up to the present time is the cost of supercharging equipment, it being practically as cheap to provide extra cylinders as it would be to provide the supercharging equipment. However, there are special cases where the saving in weight and the saving in space due to supercharging a given size engine would justify the use of this type of equipment even though there was no saving in first cost.

As a greater background of experience is obtained in the use of such equipment, it will come into use more and more.

As far as the operation of the engines go, supercharging seems to have a beneficial effect. Referring to the supercharging equipment itself, the operation, in general, has been very satisfactory, and is becoming more so right along as more experience is obtained.

**C.F.R. Motor Survey – presented by *J. B. Macauley, Jr., chairman, Motor Survey Section.***

THIS paper is the summary report of the Cooperative Fuel Research Motor Survey Section. In the survey reported the American Petroleum Institute cooperated with the C.F.R. in obtaining the octane requirements of current-model cars on the road, and in determining their vapor-handling capacity.

Octane requirements of 6 of the 25 1937 cars tested, corrected to 29 in hg. barometric pressure, showed an average value of over 70 octane number with standard spark setting, and spark advance was found to be the principal cause of the spread encountered. A difference of 1000 ft. in altitude below 6000 ft. was found to be equivalent to a change in requirement of about 3 octane numbers. Vapor lock was found most likely to occur on full-throttle acceleration after a stop of 5 min. following the 30-min. stabilization run, and the vapor-pressure limits of the 23 models tested ranged from 4.2 to 12.0 lb. per sq. in. when corrected to standard conditions.

The report closes with the plea for the cooperation of more motor-car manufacturers in the motor-survey work.

**1937 Road Knock Tests – Committee Report – presented by *T. A. Boyd, chairman, Road Test Planning Group.* (Paper published in full, pages 244-252, Transactions Section, June 1938 issue.)**

**Effect of Test Conditions on Fuel Rating – presented by *A. E. Becker, chairman, Laboratory Procedure Group.* (Paper published in full, pages 63-72, Transactions Section, February 1938 issue.)**

**Carburetion, Manifolding and Fuel Anti-knock Value – *Earl Bartholomew, Harold Chalk, and Benjamin Brewster, Ethyl Gasoline Corp.* (Paper published in full, pages 141-156, Transactions Section, April 1938 issue.)**

**Motion Pictures of Engine Flames Correlated with Pressure Cards – *Gerald M. Rassweiler and Lloyd Withrow, General Motors Corp.* (Paper published in full, pages 185-204, Transactions Section, May 1938 issue.)**

## National Aeronautic Meeting Washington, D. C. March 10-11, 1938

**Torsional Vibration in Inline Aircraft Engines – *R. M. Hazen and O. V. Montieth, Allison Engineering Co.* (Paper published in full, pages 335-341, Transactions Section, August 1938 issue.)**

**Carburetor Icing – *Robert Sanders, Engineering & Research Corp.***

THIS paper reports a study of the conditions under which ice will form in an airplane engine carburetor, and gives the results of tests made in flight to substantiate and amplify the study. It includes a chart for pilot's use in connection with a psychrometer installation to tell when icing is to be expected.

The application of heat to intake air is considered and rules are given to guide pilots in the use of heat controls. The testing was done at Lima, Peru, on Pan American Grace Airways, Inc., airplanes.

**Bending Stresses in Box Beams as Influenced by Shear Deformation – *Paul Kuhn, National Advisory Committee for Aeronautics.* (Paper published in full, pages 319-324, August 1938 issue.)**

**Ground Training for Instrument Flying – *Carl J. Crane, U. S. Army Air Corps.***

GROUND training for instrument flying may be considered as the dress rehearsal for the drama of instrument-controlled bad-weather flight. Instrument flying, sometimes known and referred to as "blind" flying, requires careful preparation in the technique of execution. This technique is built up from the classical demonstration of Ocker and Meyers evolved in the year 1926. From that time various ground devices have been built to assist the airman to master the various intellectual processes combined with physical reactions which may become so complex during an instrument flight along the airways of the United States under aggravated weather conditions, especially those which do not provide the pilot of the airplane with the ability to see ground or celestial objects.

Indeed, not only ground training devices, such as the Link Trainer, but also certain flight training devices which prepare the pilot to master the science of instrument flying are necessary. This necessity arises from the fact that, not only must the modern pilot possess the characteristic of graceful skill in the handling of his airplane, but he must be imbued with a well-disciplined knowledge required in the operation of aircraft under adverse weather conditions.

The purpose, therefore, of ground devices for instruction in instrument flying is to prepare the pilot in the simplest and most effective manner and with the least cost to master the ever-changing science of instrument flying.

**Propeller Problems Imposed by Substratosphere Flight – *C. F. Baker, Hamilton Standard Propellers.* (Paper published in full, pages 285-288, Transactions Section, July 1938 issue.)**

**Propeller Factors Tending to Limit Aircraft-Engine Powers – *G. T. Lampton, Lycoming Division, Aviation Mfg. Corp.* (Paper published in full, pages 289-292, Transactions Section, July 1938 issue.)**

**Aerodynamic Considerations Affecting Propellers for Large Aircraft Engines – *George Brady, Curtiss Propeller Division, Curtiss-Wright Corp.* (Paper published in full, pages 293-300, Transactions Section, July 1938 issue.)**

**Private Flying – *Louis deFlorez, consulting engineer, New York.***

PRIVATE flying consists essentially of adapting the airplane to individual transportation to private destinations.

Thus far, the major developments of aviation have been in the categories of military and scheduled airline transportation because the necessities of National defense and resultant Government assistance on the one hand, and large capital investment on the other, have given these classifications special impetus. Private flying has not had the benefit of such stimulus and has, therefore, lagged behind. Its progress has had to depend upon the isolated efforts of scattered individuals who happened to become interested in and take up flying for personal reasons.

Perhaps the basic factors retarding the growth of private flying have been its lack of utility under existing conditions and the high initial costs of equipment. The remedy probably lies in providing a greater number of landing facilities more suited to the purposes of private flying, thus making it possible to use the airplane in the ordinary pursuit of life and leisure. This development, in turn, will start expansion in the use of private planes, increase production, and thereby bring down the cost of airplanes.

The Government should be vitally interested in encouraging the growth of private flying because it would thus stimulate vast new economic enterprise and, at the same time, create a source from which military pilots can be drawn for National defense.

Due to its inherent speed and directness of course, the private plane can be operated on a per mileage basis at equal cost or less than the automobile.

The comparison between the automobile and the airplane should not be carried too far, however. Nor should the operation of motor cars and airplanes be regarded as similar. And even when we are in a better position to take advantage of the inherent utility of the airplane, private flying will not really come into its own until we have reared a generation of youngsters who have acquired airmanship.

**Engines for Light Airplanes – *N. N. Tilley, Continental Motors Corp.***

CIVIL aviation is interested largely in the light airplane which, with two persons, weighs about 1000 lb. gross. It lands below 40 m.p.h. and cruises from 70 to 90 m.p.h. This year there are a number of new small engines which should greatly improve take-off and climb, particularly for seaplanes.

Improvement in the life of the small engine has made possible the general acceptance of the light airplane. The increased life is due to better materials, relatively small modifications of design details, and improvements in cooling.

Adequate smoothness for this power range is given by the four-cylinder horizontally opposed type engine. There is need for efficient high-speed propellers. The common use of low-octane fuels and low landing speeds limits the compression ratio to about 5.4:1. The ell-head type is compared with the valve-in-head type. Simplicity in accessories has been the practice.

The development of the Continental A40 and A50 engines is described briefly with some indications of future performance.

**Operating Characteristics of Large Flying Boats – *W. K. Ebel, Glenn L. Martin Co.* (Paper published in full, pages 7-12 and 17-20, SAE JOURNAL, August 1938 issue.)**

**Practical Aspects of Transocean Flying – *C. H. Schildhauer, Pan American Airways.***

INTEREST in transocean flying is intense, but some of the practical aspects of the undertaking have been overlooked.

Complete and adequate terminal facilities must be made available by the various cities interested in obtaining transocean air-transport business. The author mentions some of the requirements which must be considered in the further development of these terminal facilities.

The degree of seaworthiness of flying boats is discussed in conjunction with actual data on seas obtained in the operating areas. The author recommends that a definite method of measurement be developed and constant records kept in the same manner as weather and tide data are obtained.

With the increase in the complexity of operating large flying boats, consideration must be given to the abilities of the flight personnel. Division of labor has been introduced to solve this problem.

Courses to be flown are determined not by route maps but by weather maps.

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## Section Papers

### Northern California – Jan. 21

**Plotted Transport Flight Plan – *Allan A. Barrie, Western Air Express.***

THIS paper deals with the history of the practical application of the information acquired during the development of the optimum-flight-path theory.

The flight of an airliner from point of origin to destination is divided into five operations, assuming that the airliner is equipped with an automatic carburetor and constant-speed propellers. Practical limiting factors that were found to exist in all five classifications except one are discussed. The paper explains how the accurate information of existing conditions necessary to develop a plotted transport flight plan was obtained.

It is explained how, by means of this flight plan, the altitude, the estimated flying time from point of origin to destination, and the estimated time of arrival over intermediate points could be predicted in advance with a great degree of accuracy. Actual flight examples of the operation of this plan are cited.

### Dayton – Jan. 24

**If We Don't Hang Together, We Shall All Hang Separately – *John H. Van Deventer, "The Iron Age."***

THIS paper points out that the time has come for employers and employees to discard their non-essential differences and get together on a common ground with a common purpose. That purpose is named as the mutually desirable one of keeping business in this country at a satisfactory level.

The time is now ripe for this alliance, the author points out, because we have found out that we cannot live on the promises made to us by a mythical Uncle Sam. After all, he explains, Uncle Sam is just people.

The desirability of a "Declaration of Interdependence" is stressed which may be as important to the future of America as the Declaration of Independence has been in the past.

### Metropolitan – Jan. 24

**Why Drain Crankcases and When – *George A. Round, Socony-Vacuum Oil Co., Inc.* (Paper published in full, pages 301-304, Transactions Section, July issue.)**

### Tulsa Group – Jan. 28

**Why a Motor Tune-Up? – *L. L. Fawcett, Auto Electric Co.***

THE main objective in tuning motors is to restore the original performance and economy built into the car by its manufacturer. The car will again deliver its original power and economy if, by repairs or adjustment, we restore the original standards.

The service man who will follow a correct series of operations in their proper order and, by the use of precision instruments, adhere to the tolerances, clearances, and specifications laid

down by the equipment and car manufacturer, will be able to do a satisfactory tune-up job.

Points that vitally affect a car's performance, and that immediately begin to wear away from the manufacturers' specifications when a new car is put into service, are the spark-plug gap, the breaker-point gap, the ignition timing, the valve-tappet clearance, and the carburetor float setting.

The main body of this paper discusses the why and where of these wearing points, and recommends methods to compensate for this wear before a perceptible loss in performance is experienced.

**Milwaukee – February 4**

**Highlights in Carburetion – *F. C. Mock, E. O. Wirth and W. A. Gebhardt, Bendix Products Corp.***

THE present generally used form of carburetor represents fifty years of development, and the rather marked similarity of the different makes is testimony that this present form represents pretty nearly the best compromise possible between cost and performance.

Although the carburetor is only one link in the chain of functions necessary for engine operation, it is not only a sensitive one, but an easily changed one so that, often in the case of faults which are not primarily its own, a change in carburetor setting does partially correct the trouble. An important point in selecting carburetor settings is recognition of the tolerances which must be considered when determining limits of rich and lean setting: including a 4 per cent minimum variation in metering of any given sample between summer and winter temperatures, plus a demonstrated variation of 6 per cent in production engines off the line, along with a $\pm 3$ per cent variation necessary in commercial production of the carburetor itself.

The paper then discusses actual engine mixture requirements, showing how the full-power mixture ratio is determined chiefly by distribution. The part-load mixture ratio requirement, however, under which fuel economy is the main consideration, is set partly by engine friction and partly by conditions of ignition and flame propagation since, in obtaining light loads, the intake charge density is diminished while the weight of the exhaust residue remains either constant or increases.

Data are given showing that the maximum improvement which might be expected by any possible increase in atomization and distribution with present manifold systems would amount to about 3 per cent gain in torque but at least a 10 per cent reduction in fuel consumption at full load.

A description is given of recent developments in eliminating vapor lock and percolation with high-volatility gasolines, as well as of other recent developments.

**Metropolitan – February 8**

**Application of Fuel Injection Equipment Units – *H. C. Edwards, Timken Roller Bearing Co.***

DIFFERENT types of mountings which must be provided in adapting fuel-injection equipment to Diesel engines are outlined in this paper. The several parts making up the fuel-injection system are described in order to show the functions that they perform. It is pointed out that a successful adaptation of these units can be made only if they are built in such a way as to facilitate their assembly in positions where they are on either side of the engine and operate in either direction.

The four important arrangements of fuel-pump drives and mountings in general use are cited as: mounting a pump and nozzle for each cylinder; assembly of all pumping units in one housing, which also contains the actuating means or camshaft; flange-mounting, where the drive is entirely enclosed by a flange which is attached to one end of the pump proper, mating with a corresponding flange on the engine; and pump application is combined with the nozzle mounting – the pump and nozzle are integral and a single unit serves each cylinder.

**Washington – February 8**

**Supercharging of Diesel Engines – *E. D. Newell, Bureau of Engineering, Navy Department.***

VARIOUS methods of supercharging Diesel engines are discussed, together with the names of the manufacturers employing them and some typical installations. The performance of Diesel supercharged engines is compared with the same engines operating with atmospheric induction.

Three types of superchargers which derive their energy from the exhaust gases of the engines that they serve are dealt with in considerable detail, as are types of superchargers that derive their energy solely from the dynamic action of fluid columns.

In conclusion, it is observed that the process of the survival of the fittest is applicable to supercharging as well as to men, and that supercharging is not a universal remedy but, for some applications, it can be used successfully.

**High-Speed Heavy-Duty Diesel Engines in Industry – *O. D. Treiber, Hercules Motors Corp.***

AFTER a brief review of the history and operating fundamentals of the Diesel engine, this paper takes up problems introduced

by the reduction of size, weight, mounting dimensions, coupled with the increase in speed necessary for successful automotive Diesel engines. The principal problem is named as one of combustion and of the mixing of the fuel with the air in the cylinder in the short time and space available.

The solution of these problems as exemplified by the Hercules automotive Diesel engines is outlined. The author explains that the goal in this work is to develop automotive Diesel engines that will parallel the performance of the gasoline engine.

**Slow and Medium Speed Diesel Engines – *Paul Weeks, Caterpillar Tractor Co.***

THIS paper traces the development of the Diesel engine from the slow, cumbersome units of forty years ago that weighed several hundred pounds per horsepower to the small, light-weight high-speed automotive units of today. The differences in service requirements and design features among tractor, railroad and automotive Diesels are explained and discussed.

The author points out that the Diesel engine of today is only 10 per cent more efficient from a fuel-consumption standpoint than the first Diesel of 1898, and that Diesel sales in the United States have increased from 280,000 b.hp. in 1933 to 2,800,000 b.hp. in 1937. Of the many improvements made in the period from 1929 to 1933, the development of the solid-injection system is said to have been the single design improvement which reduced engine weights and costs more than any other item. The advantages of Diesel locomotives over those powered by steam are enumerated.



## Applications Received

(*Concluded from page 17*)

**St. Louis Section**

SQUYER, ALBERT R., chief engineer, Weaver Manufacturing Co., Springfield, Ill.

**Southern New England**

VAN ALSTYNE, HAROLD L., aeronautical engineer, Hamilton Standard Propellers, East Hartford, Conn.

**Washington Section**

EWBANK, WALTER J., research engineer, Briggs Clarifier Co., Washington, D. C.

**Outside of Section Territory**

DE BEAUMONT, PIERRE STUART, draftsman, Henry R. Hinckley, Inc., Southwest Harbor, Me.

HUGGINS, BYRON ROLL, sales and service, National Supply Co., Houston, Tex.

LABORDE, FRED NESTOR, U. S. Air Corps, Flying Cadet, F.C.D., Co. A, Randolph Field, Tex.

MCINERNEY, JAMES L., president, McInerney Spring & Wire Co., Grand Rapids, Mich.

TOWERS, LEO H., sales engineer, Diesel Power Co., Tulsa, Okla.

**Foreign**

BOOTH, ARTHUR GEORGE, chief chassis engineer, Humber Ltd., Coventry, England.

BROEZE, J. J., acting manager, Delft Laboratory, N. V. de Bataafsche Petroleum Maatschappij, The Hague, Holland.

GLATHAR, WILLY, representative, General Motors Near East S.A., Alexandria, Egypt.

HALLIDAY, IAN ANDREW WOOD, assistant engineer, Birmingham & Midland Motor Omnibus Co. Ltd., Birmingham, England.

JAMES, HERBERT DOWIE CADET, assistant manager, Car Repairs Pty., Ltd., Sydney, N.S.W., Australia.

## About Authors

(*Concluded from page 5*)

***of G. M. C. in 1921. Now as chief engineer of the Delco-Remy Division, he also finds time to participate in the work of the Electrical Equipment Division of the SAE Standards Committee on which he has served during the past two years. An earlier paper by Mr. Critchfield, "Modern Automotive Electrical Equipment," was published in the August 1937 SAE Journal.***

● **G. H. B. Davis** ***(M '35), while in the Development and Research Division of the Standard Oil Co. of Louisiana and active in refinery process work, particularly on hydrogenation projects, discovered and patented Paraflow, a product now widely used in the petroleum industry to reduce pour point of oils. He had joined S.O. of La. in 1927 after doing research and teaching work at M.I.T. for four years following his graduation from the University of Kentucky. In 1932 he assumed responsibility for automotive and aviation lubricant research work for the Standard Oil Development Co., and has since advanced to his present position as director of the Esso Laboratories.***

● **W. E. Drinkard** ***was graduated from the University of Colorado in 1932 and did graduate work for his master's degree at Yale University, where he was a pupil of Prof. Herbert W. Best. He has been connected with the Chrysler Corp. for the past four years, during which period he has done considerable work on engine and fuel research, specializing on the related problems of fuel and car performance.***

● **C. B. Kass** ***(A '31), after graduating from the University of Pennsylvania as a mechanical engineer in 1926, immediately started work with the Standard Oil Co. of N. J. as a student engineer. Two years later he joined the Standard Oil Development Co. and engaged in laboratory and road knock-testing work, participating in the road tests at Uniontown, Pa., in 1932 and 1934. He now heads the fuels performance division of the Esso Laboratories.***

● **J. B. Macauley, Jr.,** ***(M '24) is responsible for the direction of many of the research problems carried on by the Engineering Division of Chrysler Corp. During his 15 years with this company he has acted as head of the Power Plant Division and as chief engineer of the Chrysler Division. His activities in problems mutual to the automotive and petroleum industries have included membership on many of the Society's fuels and lubricants committees.***

● **J. R. Sabina** ***(M '35), who is best known as a specialist in automotive fuels and lubricants, started his career as an electrical engineer in the Baldwin Locomotive Works, after graduating from the University of Pennsylvania in 1923. In 1925 he joined the Atlantic Refining Co. as plant test engineer and in 1930 was transferred to the automotive laboratory to work on an electrical method for determining fuel detonation tendencies. Since that time he has continued in general fuels and lubricants work and has been active in cooperative programs sponsored by the SAE along these lines. Early in 1936 he was placed in charge of Atlantic's automotive laboratory. At the close of 1937 he transferred to du Pont de Nemours & Co., as manager of the petroleum chemicals testing laboratory, a new division formed for the purpose of furthering this company's work in the field of addition agents for the products of the petroleum industry.***

● **Stanwood W. Sparrow** ***(M '17) has been engaged continuously in automotive engineering ever since his graduation from Worcester Polytechnic Institute and is recognized as a leader in engine development work. He joined the engineering department of Studebaker Corp. in 1927, was in charge of engine development work for many years and since December, 1936, has been head of the engineering research department. He came to Studebaker from the Automotive Power Plant Section of the National Bureau of Standards. Previously he had been with the Metz Co. and the Stevens-Duryea Co. Mr. Sparrow holds membership in numerous SAE technical committees and is chairman of the Publication Committee. In 1925, he was chairman of the Washington Section.***